Base Year: 1999 By: S. Claire

SOURCE INVENTORY

CATEGORIES # 639, 646, 658, 670, 673, 676, 679

MILITARY AIRCRAFT, JET

1999 EMISSIONS

Introduction

Considered in these categories are emissions from gas turbine (Jet) engines from military aircraft at various air bases and naval field or airports in the Bay Area where military operations exist. The engine consists of a compressor, a combustion chamber and a turbine. Air entering the forward end of the engine is compressed and then heated by burning fuel in the combustion chamber. The engine uses its fan to accelerate additional air around the outside of the engine producing exhaust gases for efficient propulsion.

Normal flight and ground operation modes of the aircraft constitutes the landing/takeoff (LTO) cycle. The LTO cycle is grouped into five modes which is equivalent to two operations in an airport activity. These include:

1. startup, idle and taxi out,
2. takeoff,
3. climb out to about 2,300 feet--this height is considered the average mixing depth and assumed inversion height, wherein aircraft exhaust emissions are released below it,
4. descent/approach from about 2,300 feet, touch down, and landing run, and
5. taxi in, idle and shutdown.

There are numerous types of military aircraft in use today. Aircraft types considered in these categories include only those believed to be of significant at present or over the next few years.

Methodology

The number of operations were estimated from the four military air bases/naval facilities and four airports in the Bay Area. The LTO cycle has its equivalent operating time-in-mode (TIM) which is the time for a particular aircraft to go through each of the five modes (see AP-42, Table II-1-3). Composite modal emission rates (MER) for each of the various types of aircraft engines now in military use were developed from various references on aircraft engine tests (see AP-42, Table II-1-7). Emission rates vary according to engine type and operating mode.

Emission factors for a specific aircraft were estimated by the equation:

$$\text{Emission Factor} = N \times E(v_e/v_t)\ m, p \times TIM$$

N = no. of engines; TIM = time in mode, hr.
(v_e/v_t) m, p = engine emission rates, lbs/hr. at mode m, pollutant p

Composite Emission Factors for each of the military bases were estimated using estimates of aircraft mix for each facility based on historical activity and data on home-based aircraft.

Sample calculation:

Data: 70,560 LTO/yr. (for Cat #658, Jet Aircraft. at Travis AFB)
Emission Factor = 63.744 lbs. organics/LTO

Emissions = 70,560 LTO/yr x 63.744 lbs/LTO / 365 day/yr / 2000 lbs/T
= 6.16 tons/day of organics

Monthly Variation

Monthly distribution was estimated to be the same for all months, due to lack of information.

County Distribution

The county location of each airbase, naval facility, or airport with military activities in the Bay Area was used to distribute emissions into each county.

TRENDS

History

Emissions through the years were based on the estimated and (some) reported number of operations for each airbase/naval facility/airport.

Growth

Projection to year 2010 was estimated based on reports on General Conformity Determination for military bases, the Moffett Field Comprehensive Use Plan, and the Regional Airport Plan Update Program. The closing of several military installation due to cutbacks and ease of tension of the cold war will bring about lesser military aircraft operations in the Bay Area.